

## Homework Chapter 8

**Problem 8-1:** A rack is made from roll-formed sheet steel and has the cross section shown.

Determine the location  $(x_c, y_c)$  of the centroid of the cross section. The dimensions are indicated at the center thickness of each segment.

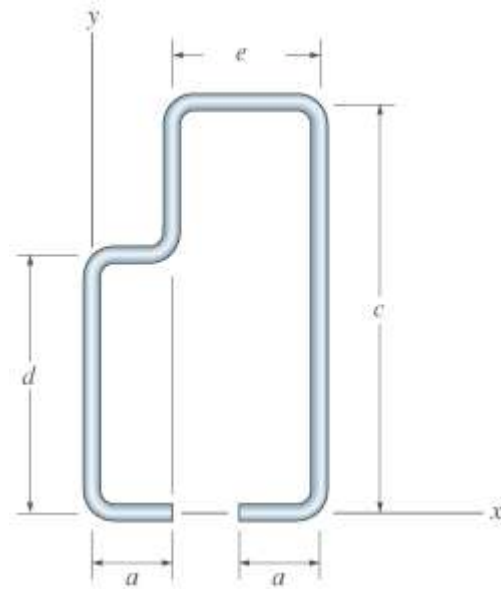
Given:

$$a = 15 \text{ mm}$$

$$c = 80 \text{ mm}$$

$$d = 50 \text{ mm}$$

$$e = 30 \text{ mm}$$



**Problem 8-2:** The gravity wall is made of concrete. Determine the location  $(x_c, y_c)$  of the center of gravity  $G$  for the wall.

Given:

$$a = 0.6 \text{ m}$$

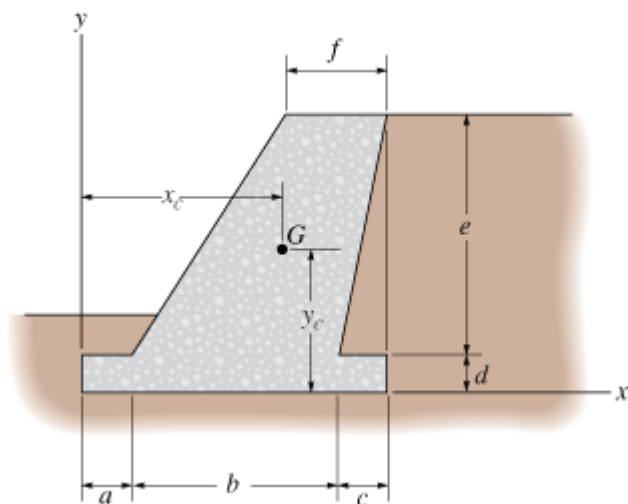
$$b = 2.4 \text{ m}$$

$$c = 0.6 \text{ m}$$

$$d = 0.4 \text{ m}$$

$$e = 3 \text{ m}$$

$$f = 1.2 \text{ m}$$



**Problem 8-3:** Locate the centroid ( $x_c, y_c$ ) of the shaded area.

Given:

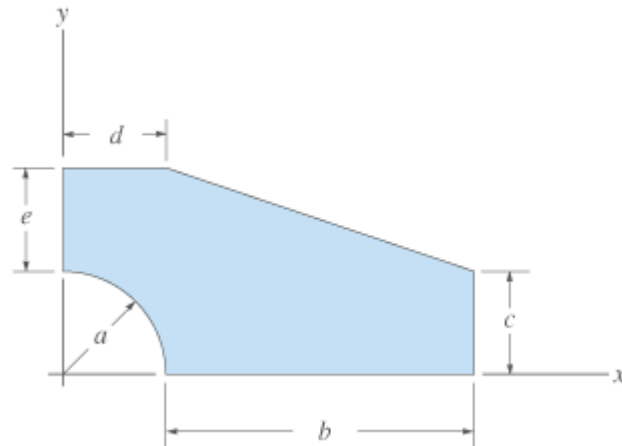
$$a = 1 \text{ m}$$

$$b = 3 \text{ m}$$

$$c = 1 \text{ m}$$

$$d = 1 \text{ m}$$

$$e = 1 \text{ m}$$



**Problem 8-4:** Locate the centroid ( $x_c, y_c$ ) of the shaded area.

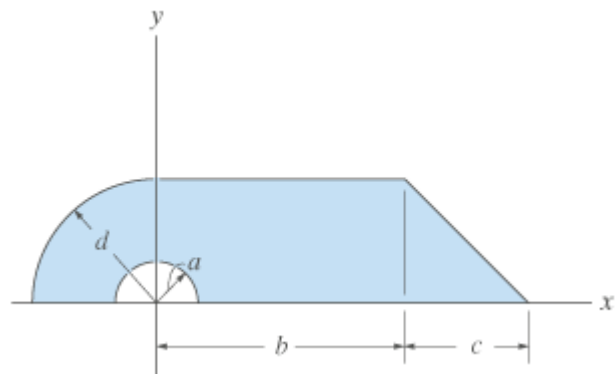
Given:

$$a = 1 \text{ m}$$

$$b = 6 \text{ m}$$

$$c = 3 \text{ m}$$

$$d = 3 \text{ m}$$



**Problem 8-5:** Determine the location  $y_c$  of the centroidal axis  $x_c x_c$  of the beam's cross-sectional area. Neglect the size of the corner welds at A and B for the calculation.

Given:

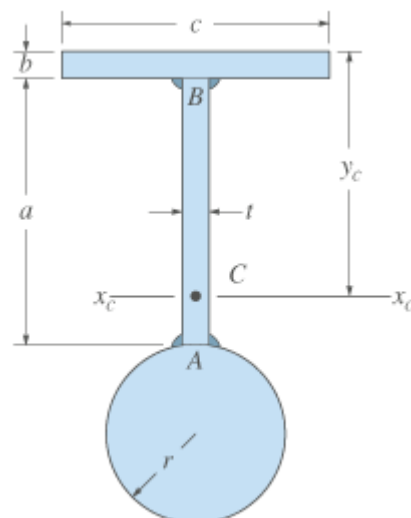
$$r = 50 \text{ mm}$$

$$t = 15 \text{ mm}$$

$$a = 150 \text{ mm}$$

$$b = 15 \text{ mm}$$

$$c = 150 \text{ mm}$$



**Problem 8-6:** Determine the location  $(x_c, y_c)$  of the centroid  $C$  of the area.

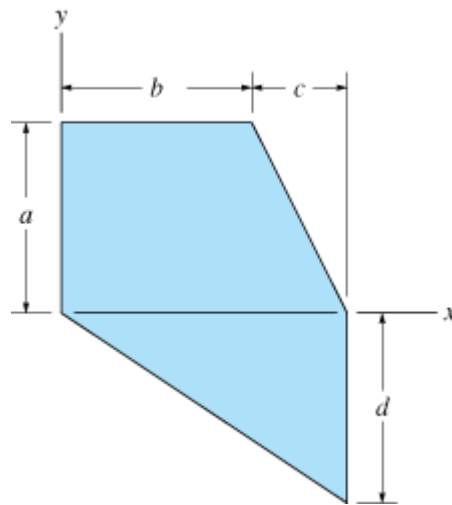
Given:

$$a = 6 \text{ m}$$

$$b = 6 \text{ m}$$

$$c = 3 \text{ m}$$

$$d = 6 \text{ m}$$



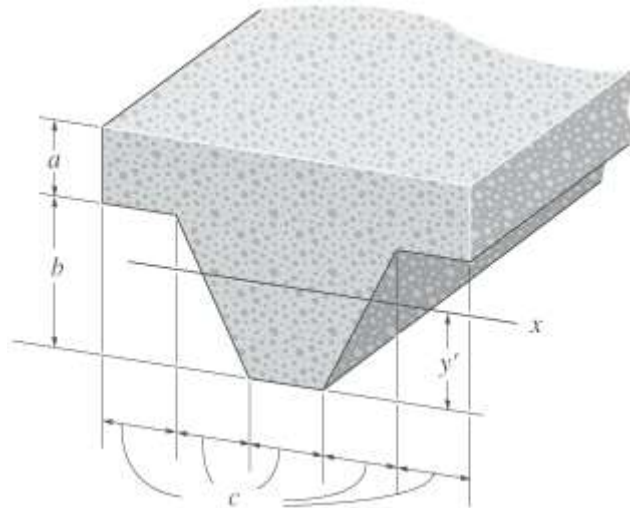
**Problem 8-7:** Locate the centroid  $y_c$  for the beam's cross-sectional area.

Given:

$$a = 120 \text{ mm}$$

$$b = 240 \text{ mm}$$

$$c = 120 \text{ mm}$$



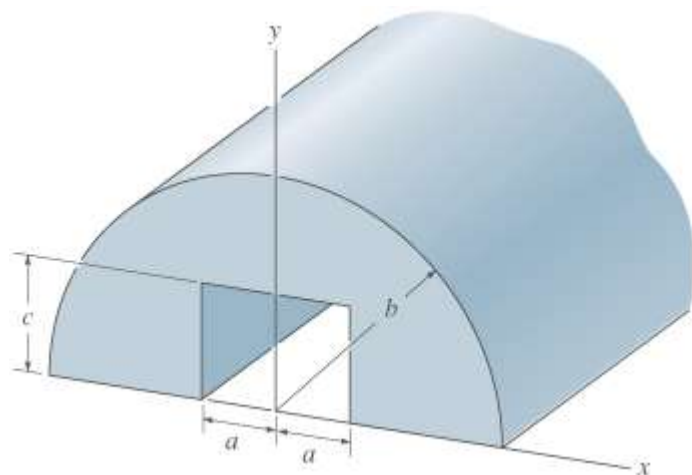
**Problem 8-8:** Locate the centroid  $y_c$  for the strut's cross-sectional area.

Given:

$$a = 40 \text{ mm}$$

$$b = 120 \text{ mm}$$

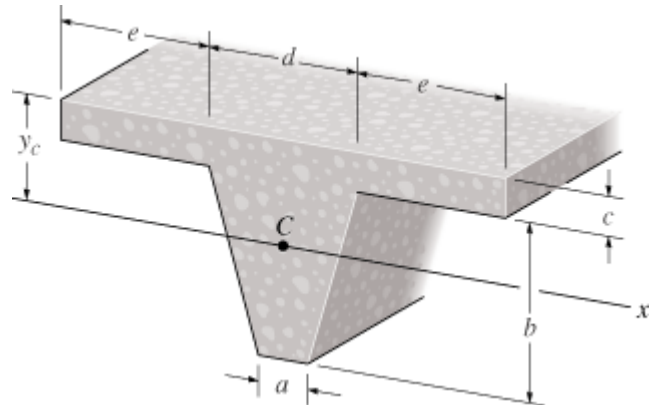
$$c = 60 \text{ mm}$$



**Problem 8-9:** Locate the centroid  $y_c$  of the concrete beam having the tapered cross section shown.

Given:

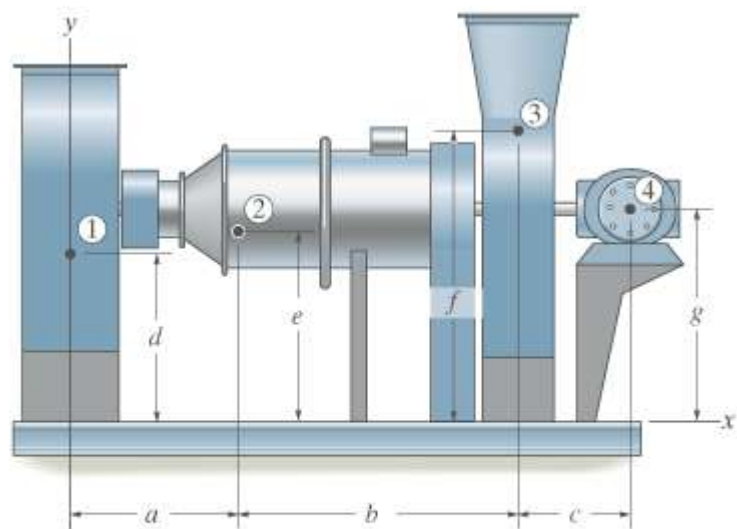
$$\begin{aligned} a &= 100 \text{ mm} \\ b &= 360 \text{ mm} \\ c &= 80 \text{ mm} \\ d &= 300 \text{ mm} \\ e &= 300 \text{ mm} \end{aligned}$$



**Problem 8-10:** Determine the location  $(x_c, y_c)$  of the center of mass of the turbine and compressor assembly. The mass and the center of mass of each of the various components are indicated below.

Given:

$$\begin{aligned} M_1 &= 25 \text{ kg} \\ M_2 &= 80 \text{ kg} \\ M_3 &= 30 \text{ kg} \\ M_4 &= 105 \text{ kg} \\ a &= 0.75 \text{ m} \\ b &= 1.25 \text{ m} \\ c &= 0.5 \text{ m} \\ d &= 0.75 \text{ m} \\ e &= 0.85 \text{ m} \\ f &= 1.30 \text{ m} \\ g &= 0.95 \text{ m} \end{aligned}$$



- |                    |       |
|--------------------|-------|
| 1. Intake housing  | $M_1$ |
| 2. Turbine         | $M_2$ |
| 3. Exhaust housing | $M_3$ |
| 4. Compressor      | $M_4$ |